

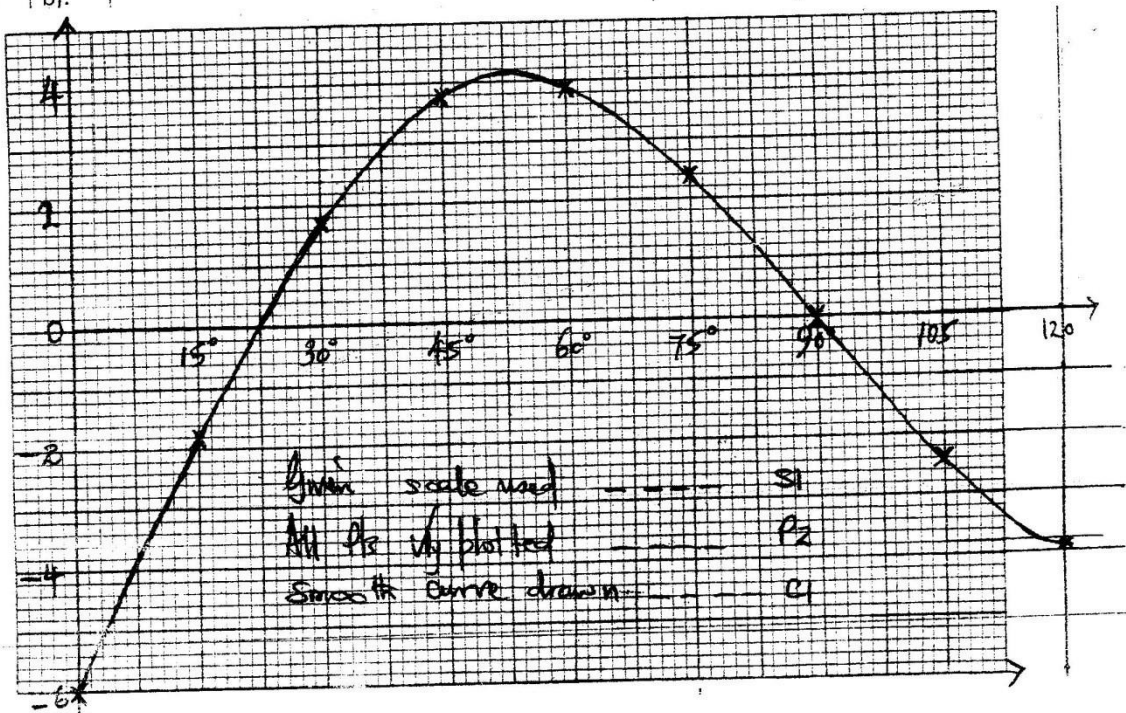
121/2 MATHEMATICS 2007

No.	Workings	Marks	Other alternative																
1.	<table style="border-collapse: collapse; margin-left: 20px;"> <tr> <td style="border: none;">No.</td> <td style="border: none;">Log</td> </tr> <tr> <td style="border: none;">0.32</td> <td style="border: none;">2.5051</td> </tr> <tr> <td style="border: none;"><u>14.26</u></td> <td style="border: none;">1.1541 +</td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;"><u>1.6592</u></td> </tr> <tr> <td style="border: none;">0.006</td> <td style="border: none;"><u>3.7782 -</u></td> </tr> <tr> <td style="border: none;"></td> <td style="border: none;">1.8810</td> </tr> <tr> <td style="border: none;">(4)</td> <td style="border: none;">1.8810 x 2/3</td> </tr> <tr> <td style="border: none;">17.95</td> <td style="border: none;"><u>1.2540</u> = 17.95</td> </tr> </table>	No.	Log	0.32	2.5051	<u>14.26</u>	1.1541 +		<u>1.6592</u>	0.006	<u>3.7782 -</u>		1.8810	(4)	1.8810 x 2/3	17.95	<u>1.2540</u> = 17.95	3 marks M1 M1 A1 3	3 logs Division 3 By 2
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0.32	2.5051																		
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2.	$yx + 3yz = 2x - 2$ $yx - 2x = 03z - 2$ $x(y-2) = -3yz - z$ $x = \frac{-3yz - z}{y-2}$	3 marks M1 M1 A1 3	Or equivalent																
3.	$3 \cos x = 2(1 - \cos^2 x)$ $3 \cos x = 2 - 2 \cos^2 x$ $2 \cos^2 x + 3 \cos x - 2 = 0$ $2y^2 + 3y - 2 = 0$ $(2y-1)(y+2) = 0$ $y = \frac{1}{2} \text{ or } y = -2$ $\cos x = 0.5$ $x = 60^\circ, 300^\circ$	4 marks M1 M1 A1 B1 4	Substitute Or <i>Equivalent</i>																
4.a)	$(1 + \frac{1}{2}x)^5 = 1^5 \cdot 1.1(1.2x)^0$ $+ 5 \cdot 1^4(\frac{1}{2}x)^1 + 10 \cdot 1^3(\frac{1}{2}x)^2 + 10 \cdot 1^2(\frac{1}{2}x)^3$ $+ 5 \cdot 1^1(\frac{1}{2}x)^4 + 1 \cdot 1^0(\frac{1}{2}x)^5$ $= 1 + \frac{5}{2}x + \frac{5}{2}x^2 + \frac{5}{4}x^3 + \frac{5}{16}x^4 + \frac{1}{32}x^5$	2 marks M1 A1 2																	
b).	$1^{1/20} = 1 + \frac{1}{20} = \frac{1}{2}x = \frac{1}{20} \quad x = \frac{1}{10}$ $(1^{1/20})^5 = 1 + \frac{5}{20}x^1 + \frac{10}{100}x^2 + \frac{10}{100}x^3 + \frac{5}{200}x^4 + \frac{1}{200}x^5$ $= 1 + \frac{1}{4}x + \frac{1}{20}x^2 + \frac{1}{20}x^3 + \frac{1}{40}x^4 + \frac{1}{200}x^5$ $= 1.11/40$	2 marks M1 2	Or 1 + 0.25 + 0.25 M1 = 1.275 AL																
5.	$S = \int (2-t) dt$ $S = 2t - \frac{t^2}{2} + c$ When s = 5, t = 2 $5 = 2 \times 2 - \frac{2^2}{2} + c$ $= 3$ $S = 2t - \frac{1}{2}t^2 + 3$	3 marks M1 M1 A1 3																	
6.	$\text{Interest} = (13800 - 2280) \times \frac{20}{100} \times 2$ $= 11520 \times 0.2 \times 2$ $= 4608$ Monthly instalments $= \frac{11520 + 4608}{24}$ $= \text{Kshs. } 672$	3 marks M1 M1 A1 3																	

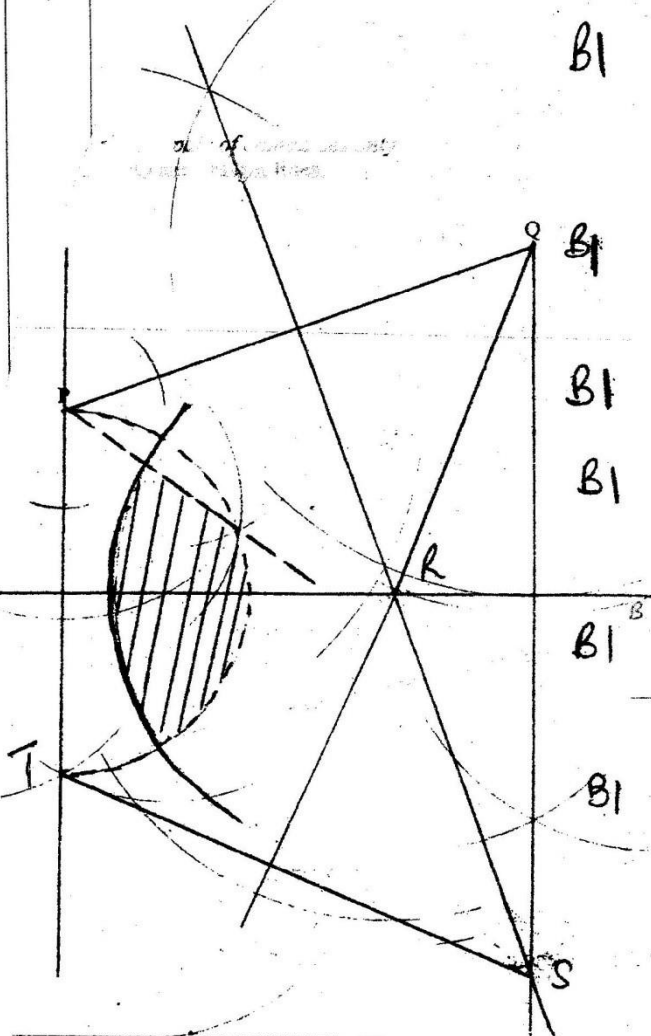
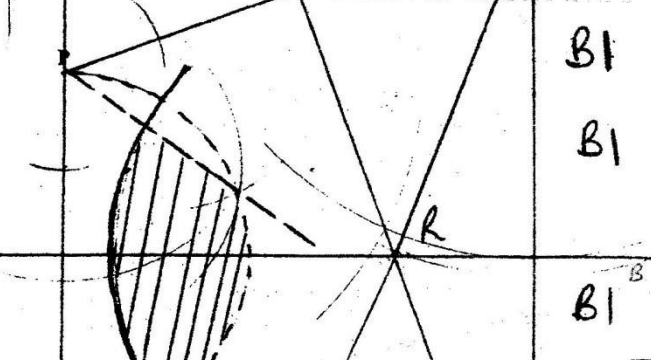
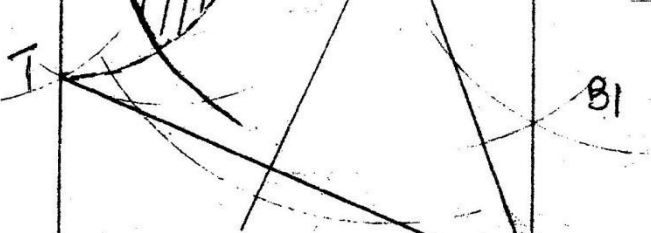
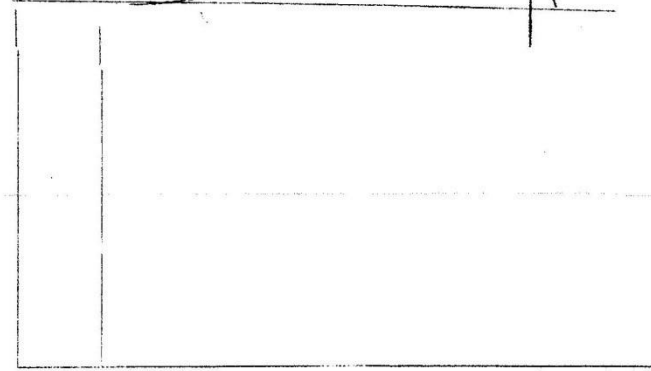
7.	$\left(\frac{6+2}{2}, \frac{1+3}{2}\right) = (4, 2)$ $M_1 M_2 = \frac{1-3}{6-2} \times m_2 = -1$ $M_2 = 2$ $Y - 2 = 2$ $X - 4$ $= 2x - y = 6$	4 marks B1 M1 M1 A1 4	Or equivalent
8.	Greatest possible error $= \frac{64(3.15 - 3.05)}{2}$ $= \frac{201.6 - 195.2}{2}$ $= 3.2 \text{ cm}^2$	2 marks M1 A1 2	
9.	$2.5 \text{ litres} = 2500 \text{ cm}^3$ $\frac{4}{5} \times 2500 = 2000 \text{ cm}^3 (\text{water})$ $\frac{1}{5} \times 2500 = 500 \text{ cm}^3 (\text{milk})$ $200 \times 1 + 500 \times 1.2$ $= 2600 \text{ gm}$	3 marks M1 M1 A1 3	$\frac{4 \times 1 + 1 \times 1.2}{5}$ $= 1.04$ 1.04×2500 $= 2600 \text{ g}$
10.	$\frac{67 - 32}{14}$ $= 2.5$ $T_7 = 67 - 6 \times 2.5$ $= 52 \text{ cm}$	M1 M1 A1 3	or equivalent
11. a).	$NR = \sqrt{42 + 7.52}$ $= 8.5$	4 marks B1	
b).	AN $QR (14 + 8.5) - 7.52$ $QR = 25$ $4 \times AN = 14 \times (8.5 - 2.5)$ $AN = \frac{14 \times 6}{4}$ $= 12 \text{ cm}$	M1 M1 A1 4	
12.	$ r = \sqrt{3^2 + (-1)^2 + (1 \frac{1}{2})^2}$ $= 3.5$ $\Rightarrow \vec{r} = 2 \hat{i} = 6\hat{i} - 2\hat{j} + 3\hat{k}$	2 marks B1 B1 2	
13.	Longitude difference $= 360 - (133 + 118)$ $= 109$ $109 \times 60 \cos x = 5422$ $\cos x = 0.8291$ $x = 33.99^\circ$ longitude of A or B $\approx 34^\circ \text{ N}$	3 marks M1 M1 A1 3	
14.	The value of k, $y = K(x + 1)(x - 2)$	2 marks M1	

	<p>when $x = 0$ and $y = 2$ $2 = k(1) (-2)$ $2 = -2k$ $K = -1$</p>	<p>A1 2</p>	
15.	$\frac{3}{\sqrt{5+2}} + \frac{1}{\sqrt{5}} = \frac{3(5+2)}{5-4} + \frac{1\sqrt{5}}{5}$ $= 3\sqrt{5} + 6 + \frac{1\sqrt{5}}{5}$ $= 6 + 3\frac{1\sqrt{5}}{5}$	<p>3 marks M1 M1 A1 3</p>	
16.	$X^2 + Y^2 - 3/2x + y = 1/4$ $X^2 - 3/2x + 9/16 + y^2 + y + 1/4$ $= -1/4 + 9/16 + 1/4$ $= 9/16$ $(x - 3/4)^2 + (y + 1/2)^2 = 9/16$ <p>Centre $(3/4, -1/2)$ Radius $= 3/4$</p>	<p>4marks B1 B1 B1 B1 <u>4</u></p>	<p>√ left hand side √ right hand side</p>
17	<p>Fraction filled in 1hr a). $= 2/9 + 1/3 = 5/9$ i). Time taken $= 1^4 / \text{shr}$</p>	<p>2 marks M1 A1 2</p>	
	<p>ii) Fraction filled in 1 hot $= 5/9 - 1/2 = 1/8$ Time taken $= 18\text{hr}$</p>	<p>2 marks M1 A1</p>	
	<p>b).i) $= 2/9 \times 1 + 1/3 \times 1/4$ $= 2/9 + 1/12$ $= 11/36$</p>	<p>M1 M1 A1</p>	<p>P for 45min: $2/9 \times 3/4 = 1/6$ P & Q for 15min $5/9 \times 1/4$ $= 5/36$ Fraction filled at 9.00am $1/6 + 5/36$ M1 $= 11/36$ A1</p>
	<p>ii). Time taken after 9.00am To fill up the tank $= 25/36 \times 18$ $= 12\frac{1}{2}$ Time when the tank filled up $= 9.00 + 12\frac{1}{2}$ $= 21:30\text{hr}$ (9.30pm)</p>	<p>3 marks M1 M1</p>	

18.	$Y = \frac{k}{x^n}$	1 mark B1																															
a).i)	$K = yx^n$	7 marks	<i>All methods</i>																														
ii).	$K = 12x^{2n}$ $K = 3 \times 4^n$ $\Rightarrow 12 \times 2^n = 3 \times 4^n$ $4 \times 2^n = 4^n$ $2^{n+2} = 2^{2n}$ $n+2 = 2n$ $n = 2$ $K = 48$	B1 B1 M1 M1 M1 1A B1	$K = 12x(2^n)$ $K = 3 \times 4^n$ $k/12 = 2^n$ and $k/3 = (2^n)^2$ $k^2/144 = (2^n)^2$ $k/3 = k^2/144$ $48k = k^2$ $K^2 - 48k = 0$ $K(k-48) = 0$ $K = 0$ or $k = 48$																														
b).	$y = \frac{48}{(5^{1/3})^2}$ $= \frac{48 \times 9}{16^2}$ $= \frac{27}{16}$ $= 1 \frac{11}{16}$	2 marks M1 A1 Total 10																															
19.		2 marks																															
a).	<table border="1"> <thead> <tr> <th>x</th> <th>0°</th> <th>15°</th> <th>30°</th> <th>45°</th> <th>60°</th> <th>75°</th> <th>90°</th> <th>105°</th> <th>120°</th> </tr> </thead> <tbody> <tr> <td>Y=8sin</td> <td>-6</td> <td>-1.8</td> <td>1.7</td> <td>3.8</td> <td>3.9</td> <td>2.4</td> <td>0</td> <td>-2.4</td> <td>-3.9</td> </tr> <tr> <td>2x-6cos</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	x	0°	15°	30°	45°	60°	75°	90°	105°	120°	Y=8sin	-6	-1.8	1.7	3.8	3.9	2.4	0	-2.4	-3.9	2x-6cos										B1 B1	\sqrt{y} for $x = 30^\circ$ \sqrt{y} for $x = 105^\circ$
x	0°	15°	30°	45°	60°	75°	90°	105°	120°																								
Y=8sin	-6	-1.8	1.7	3.8	3.9	2.4	0	-2.4	-3.9																								
2x-6cos																																	
b).	Graph																																



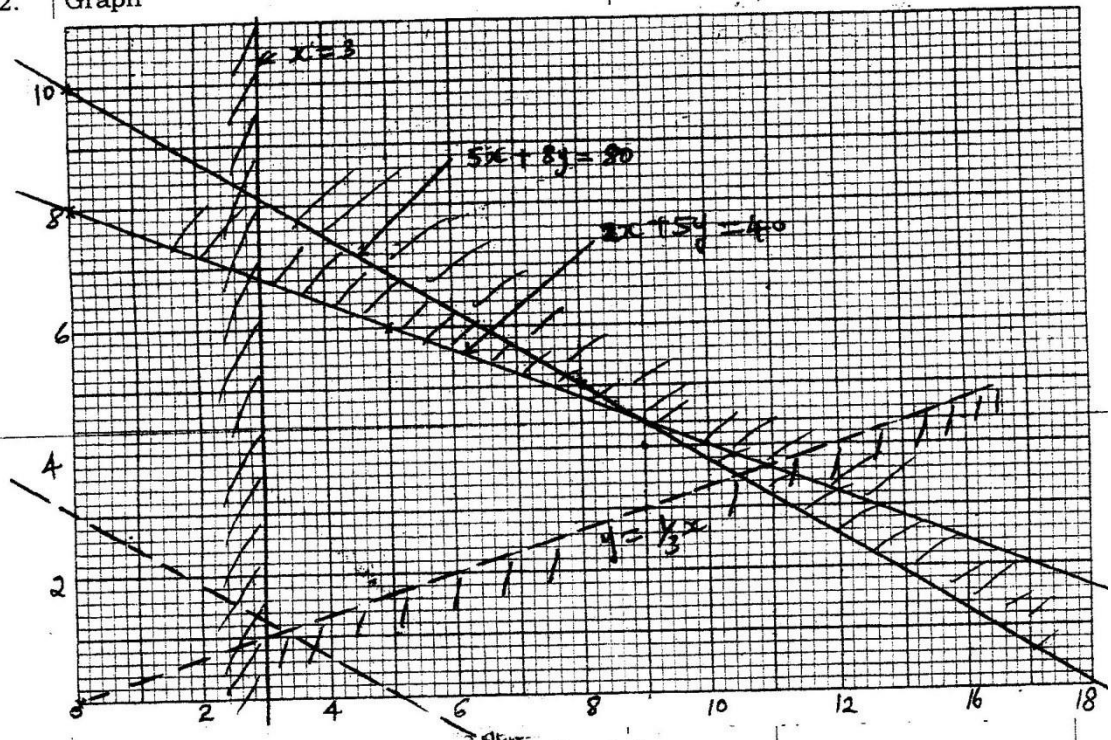
c).i)	$Y = 4.1 \pm 0.1$	1 mark B1	
ii).	$8\sin 2x - 6 \cos x = 2$ $X = 31.5^\circ \pm 0.75$ $X = 78^\circ \pm 0.75$	B1 B1 B1 10	
20. a). i).	$y = \frac{1}{2}x^2 + x + c$ at $x = -4, y = 6$ $6 = (-4)^2 - 4 + c$ $6 = 16 - 4 + c$ $C = -6$ $Y = x^2 + x - 6$	3 marks M1 M1 A1 3 marks M1 M1 A1	
ii).	$X^2 + x - 6 = 0$ $(x - 2)(x + 3) = 0$ $X = 2, x = -3$		
b).	$\int_{-3}^2 (x^2 + x - 6) dx$ $= \left[\frac{x^3}{3} + \frac{x^2}{2} - 6x \right]_{-3}^2$ $= \left[\frac{8}{3} + \frac{4}{2} - 12 \right] - \left[\frac{-27}{3} + \frac{9}{2} + 18 \right]$ $= -\frac{71}{3} - 13.5$ $= -\frac{205}{6}$ Area = $\frac{205}{6}$ square units	4 marks M1 M1 A1 B1 10	

21. a.i).	Gra	B1	(i) \perp bisector of PQ constructed and point R marked
		B1	
		B1	
		B1	
		B1	
		B1	
		B1	
		B1	(ii) \perp dropped from Q to AB or \angle PRB transferred to \angle BRS RS \perp form P to AB constructed PT=2 length of \perp and polygon completed R from TS = 4.6 \pm 0.1
		B1	RS marked equal to
		4 marks	
		B1	Bisect of \angle QPT drawn dotted
		B1	Arc centre R with radius 4.5cm drawn
		B1	Semi circle with PT as diameter drawn dotted
		B1	correct region shaded
		B1	

22.

Graph

10 marks



23.a)

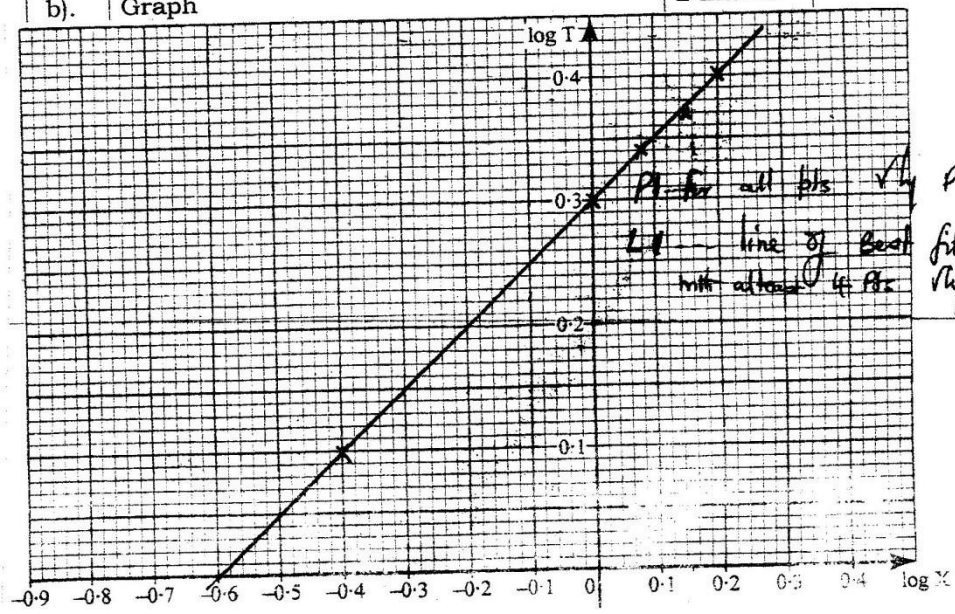
Log x	-0.40	0.00	0.08	0.15	0.20
Log T	0.10	0.30	0.34	0.37	0.40

2 marks
B2

b).

Graph

2 marks



ii).	$a = \log^{-1} 0.3 = 2.00$ $b = \text{gradient} = \frac{0.4 - 0.1}{0.1 - (-0.4)}$ $= \frac{0.3}{0.5}$ $= 0.6$	B1 M1 A1	
c).	$\text{Log } T = b \log x + \log a$ $0 = 0.5 \log x + 0.3$ $\text{Log } x = \frac{-0.3}{0.5}$ $= -0.6$	3 marks M1 M1 A1	
24.a)	$P(RR) = \frac{4}{6} \times \frac{2}{5}$ $= \frac{8}{30}$ $P(YY) = \frac{2}{6} \times \frac{3}{5}$ $P(\text{same colour}) = \frac{8}{30} + \frac{6}{30}$ $= \frac{14}{30} = \frac{7}{15}$	4 marks M1 M1 M1 A1 4	
b.i)	$P(R_A R_A) = \frac{4}{6} \times \frac{3}{5}$ $= \frac{2}{5}$ $P(R_B R_B) = \frac{2}{6} \times \frac{1}{4}$ $= \frac{1}{10}$ $P(R_A R_A) + P(R_B R_B) = \frac{2}{5} + \frac{1}{10}$ $= \frac{5}{10} = \frac{1}{2}$	4 marks M1 M1 M1 A1	
ii).	$P(\text{all red}) = \frac{2}{5} \times \frac{1}{10}$ $= \frac{1}{5} \times \frac{1}{5}$ $= \frac{1}{25}$	M1 A1 10	